Space Weather Forecast

Issued on Sunday, 24 March 2024 at 01:15 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Further Minor/Moderate radio blackouts (R1/R2) likely. Current S1 solar radiation conditions gradually reducing. Minor to Moderate geomagnetic storms (G1-G2) expected into days 2 and 3 (24-25 Mar) given likely coronal Mass Ejection (CME) and fast wind arrival. Slight chance of a Strong geomagnetic storm (G3).

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity rose to become High, with a strong flare from a broad region in the north disk at 23/0133UTC. The large sunspot region approaching centre disk produced 4 Moderate flares over the past 24 hours, the highest being an M5.1 at 23/1352. There are now six sunspots on the visible disc, with a small region emerging in the northwest quadrant recently numbered. The region approaching centre disk remains by far the largest and most complex group on the disc, now showing top tier complexity, having undergone significant growth across the region, as well as a later spreading trend. Changes in other groups were minor by comparison.

The main activity observed on coronagraphs in the period was a large and complex Coronal Mass Ejection (CME) associated with the strong flare. This event was clearly visible in all imagery. Provisional modelling of this CME suggest a likely impact with Earth late on the 24th or early on the 25th of March.

Solar Wind / Geomagnetic Activity: The solar wind was initially at background levels but steadily rose after 23/1200UTC as earth came into contact with the HSS (High Speed Stream) in association with a coronal hole and are currently just about at elevated levels at 500km/s. The IMF saw a change from initial weak positive values giving way to weak to moderate broadly negative values which slowly rotate weakly positive again towards midday before becoming moderate to strong largely negative values, peaking at -14nT at 23/2012UTC.

The net result of the above solar wind measures was Unsettled to Active activity with a Moderate geomagnetic storm (Kp6) at 24/0000UTC.

Energetic Particles / Solar Radiation: Solar radiation rose following the strong flare to rise above S1 levels from 23/0815UTC and above S2 levels at 23/1400UTC and remains elevated although has been on a gradual decline since 23/1800UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: Generally Moderate activity is expected, with further Moderate flares likely from the large region approaching centre disk and a slight chance of Strong flares. The most significant front side region (AR3615) remains present throughout the four days, with oncoming active regions in the northeast likely. The flare risk is held constant throughout the four days.

Solar Wind / Geomagnetic Activity: There is one Earth-directed CMEs (Coronal Mass Ejection) in the current forecast, this is associated with the Strong flare a broad region north of the northern disk at 23/0133UTC. This produces a large and complex CME provisional modelled late on Day 1 (24 Mar) or early Day 2 (25 Mar), with winds perhaps increasing to 550-600km/s before slowly declining. The other notable enhancement is from the continuing

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connection with a coronal hole, maintaining Slightly Elevated to Elevated solar winds (450-500km/s) before beginning to ease through Day 3 (26 Mar) and returning to background levels by Day 4 (27 Mar).

Geomagnetic activity initially Unsettled to Active with a chance of G1-G2 intervals early Day 1 (24 Mar) due to coronal hole effects. Either late on Day 1 (24 Mar) or early Day 2 (25 Mar) further G1-G2 minor to moderate geomagnetic storm intervals are expected with a chance of G3 strong geomagnetic intervals, given the expected arrival of the above CME.

Energetic Particles / Solar Radiation: Solar radiation is currently above the S2 moderate storm threshold following recent Strong flare activity. Radiation levels expected to slowly decline back to S1 minor storm levels during Day 1 (23 Mar), before slowly falling back to background levels during Day 2 (24 Mar).

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	Yes	80	80	20	5
Strong	G3	No	30	30	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	70	70	70	70
Very Active	R3 to R5 X	Yes	20	20	20	20

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	Yes	100	30	20	25
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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